REMARKS

In the above-captioned Final Office Action, the Examiner has rejected Claims 1-6 under 35 U.S.C. §112, first paragraph, as being non-enabling. The Examiner has further rejected Claims 1-6 under 35 U.S.C. §103(a) for being unpatentable over the Fields et al. reference, when further considered in view of the Marchitto et al. and Robertson references.

In response, independent claims 1, 5 and 6 have been amended to recite a diode pumped laser with a laser diode that does not include a temperature control system, and with a laser slab having a rectangular cross-section with polished side surfaces. The polished side surfaces of the laser slab compensate for the varying pump light wavelength of the device by reflecting diode pump internally throughout the length of the laser slab. This configuration ensures laser mode overlap throughout the entire length of the laser slab, which further allows the device to operate efficiently over a wide range of temperatures, even though the diode pump light wavelength varies according to temperature. Claims 2-4 have been amended to correct informalities and to properly depend from amended independent claim 1. Support for these amendments is found in the specification on page 1, lines 18-21, on page 2, lines 18-23, on page 4, lines 3-5 and in Figs. 1-2. Claims 1-6 remain pending.

Rejections Under 35 U.S.C. §112, First Paragraph

In an Examiner Interview on April 29, 2004, Applicant pointed out support for the proposed claim limitation of a laser slab having a rectangular cross-section in the specification to the Examiner, and the Examiner agreed that the specification was enabling. Accordingly, Applicant requests that this rejection be withdrawn.

Rejections Under 35 U.S.C. §103(a)

With respect to the rejections of Claims 1, 5 and 6, consider the overall goal of Applicant's invention. What is desired is a lightweight laser that efficiently converts pump light into an output laser beam with over a wide range of temperatures (see Page 1, Lines 16-22) as the present invention is to be used as a handheld laser rangefinder that must operate in extreme cold and extreme heat conditions. To address the weight issue, diode bars (which are the most lightweight manner of generating laser pump light) are used to generate the laser pump light. But for diode pumped lasers, the pump light wavelength varies according to temperature. A temperature control system for keeping the wavelength of the diode constant is not feasible because of the weight it would add to the device. Thus, amended claims 1, 5 and 6 call for a diode pump without a temperature control system, and the cooperating structure of the device must compensate for the resulting varied pump light wavelength of the laser diode pump.

The structure and geometry of the laser slab and the first and second cylindrical lenses that is recited in amended claims 1, 5 and 6 compensate for this varying pump light wavelength. Specifically, a laser slab with a rectangular cross section and polished sides is used, and the laser pump light is collimated in a vertical direction with a first lens and then directed into the slab with the second lens. The cross section geometry and polished side surfaces of the slab allow for laser pump light to be reflected internally along the entire length of the laser, for increased pump light absorption within the crystal along the entire length of the laser slab (Page. 4, lines 4-9). This configuration ensures that most of the pump light is absorbed, even if the absorption coefficient is low, resulting in a multiple mode laser that will operate efficiently over a wide temperature range (without a temperature control system for the diode pump) even as the laser diode pump wavelength varies.

In contrast to Applicant's invention as recited in amended independent claims 1, 5

and 6, Fields et al. discloses a laser rod 8 with a laser mode 10 concentric thereto, and not a laser slab with a rectangular cross-section, like Applicant's invention (Col. 5, Lines 35-40 and Col. 6, Line 13). Of course, since the lasing material is a rod, there are no opposing side surfaces for laser pump light to reflect off of. Indeed, the recited structure of the Field et al. reference is such that laser pump light remains confined within mode 10 and never touches the inside surface of the laser rod. This is because the Fields et al. reference is directed at obtaining a highly efficient laser output beam for diode bar pump light at a single mode, the single TEM_{00} mode (See Fields et al. Abstract), and not at multiple modes according to the diode laser pump light wavelength (which, again, varies widely with temperature). This is because Fields et al. is directed at using a plurality of diode bars and a microlens array to couple the laser pump light from each diode bar and create an high power output laser beam with minimum loss of power. The device recited in Fields does not have to operate over a wide temperature range, so there is no discussion or teaching of the structure recited in Applicant's amended claims 1, 5 and 6.

Similarly, Marchitto et al. discloses a laser pump-cavity 18 containing a laser rod 20 and a flashlamp 22 supported therein (Please see Col. 22, Lines 1-9 and Fig. 3), and not a slab/bar with a rectangular cross-section. Moreover, the only finish envisioned for any surface for the rod is a matte finish, not a polished surface. Moreover, Marchitto et al. describes alternate configurations for the matte finish 20 (See Col 22, Lines 41-64 and Figs. 13-15). However, Marchitto et al. does not even remotely address the need for a laser slab having a rectangular cross-section and/or polished opposing sides to compensate for varying diode pump light wavelength. The Marchitto et al. reference does not teach or suggest a laser slab with a rectangular cross-section and polished sides, because this structure is not needed. This is because the Marchitto et al. device is directed at medical applications, specifically interstitial fluid monitoring, hence, there is no need for the device to work over a wide range of temperature and varying pump light wave lengths. Thus, combining the Marchitto et al. reference with the Fields et al. reference does not lead to the present invention recited amended claims 1, 5 and 6.

With respect to the Robertson reference, this reference is directed at heat removal from flashlamp pumped lasers (Col. 1, Lines 36-40), which create more waste heat relative to differently-pumped lasers such as Applicant's diode-pumped laser. The Robertson reference teaches roughening the side surfaces of the laser bar to dissipate waste heat from a laser slab by reducing the transverse temperature gradient across the width of the laser crystal cross section invention (Please see Col. 1, Lines, 36-40, Col. 4, Lines 16-30 and Fig. 1). Applicant discloses polished side surfaces of the laser slab, to reflect diode pump light back into the laser slab, in order to retain as much pump light energy as possible for more efficient lasing along the entire length of the slab. Thus, the Robertson reference actually teaches away from Applicant's claimed invention as recited in the amended independent claims.

Further, and unlike Applicant, Robertson discloses a temperature control system for the pump light source, flashlamp 8. Specifically, Robertson discloses contoured sapphire blocks 9 in contact with the flash lamp 8, which contact blocks of high conductivity matter 10, which in turn contact heat sink 11 (Please see Col. 3 Line 61 through Col. 4, Line 5). Applicant's invention as recited in amended independent claims 1, 5 and 6 recites structure and cooperation of structure (the laser diode, lenses and laser slab structure) that obviate the need for this supporting temperature control system.

In sum, the Robertson reference is directed at reducing temperature gradients in the laser crystal for a flash lamp pumped laser, with the pump light source having a fairly complex temperature control system. Applicant's invention is directed at compensating for the varying pump light wavelength for a diode-pumped laser when the laser diode is not accompanied by a temperature control system due to weight considerations. Thus, there is no incentive to combine the flash lamp-pumped system of Robertson with either of the diode-pumped systems of Fields et al. and/or Marchitto et al. references, and any combination thereof still does not lead to the claimed invention in amended independent

claims 1, 5 and 6.

For the above reasons, the rejection of claims 1-6 is improper, and amended independent claims 1, 5 and 6 are patentable over any combination of Fields et al., Marchitto et al. and Robertson. Dependent claims 2-4 contain the same limitations as amended independent claims 1 and 5 and are allowable for the same reason. Reconsideration and withdrawal of this rejection are respectfully requested.

CONCLUSION

All of the stated grounds of rejection have been properly traversed, accommodated or rendered moot. Applicant has made a bona fide effort to remove informalities from the specification, and to properly amend the claims, and Applicant believes that a full and complete reply has been made to the outstanding Office Action, and that the present application is in a condition for allowance. Accordingly, a Notice to that effect is most respectfully requested. If the Examiner believes that personal communication will expedite prosecution of this application, the Examiner is invited to telephone the undersigned at the number provided. Prompt and favorable consideration of this Amendment and Reply is respectfully requested.

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Respectfully submitted,

Arthur K. Samora

Arthur K. Samora, Reg. No. 43079
Department of the Army
CECOM Intellectual Property Division
AMSEL-LG-C-BLVE
10235 Burbeck Road
Fort Belvoir, VA 22060-5806
(703) 704-2227